

12 / CAMERA¹

Your Visual Language teacher or Digital Media Workshop instructor will walk you through basic camera operation in class, providing an opportunity to familiarize yourself with the camera and ask questions. This handout does not provide detailed step-by-step camera usage instructions, however, it provides an overview of the most important camera concepts and provides links to resources for additional study and exploration.

FUNDAMENTALS

Camera menus have so many functions that you can get lost trying to read them. The good news is that the most important aspects of camera operation are easy to understand. You can discover the nuance of how they all work together by looking at pictures and experimenting, but we will get you started with the essentials.

ISO

ISO refers to the level of light sensitivity. With film it's usually referred to as "film speed." speed. The lower the number the less sensitive to light and in most cases the use of lower ISO results in images with less digital noise artifacts.

So on a bright sunny day you might shoot at 100 ISO and inside a dim room you might need to shoot at 800 ISO or higher in order to shoot at a shutter speed high enough to continue shooting handheld. There is a trade off though. The higher the number the grainier your image will look. Colors may not look as

good (which is why a lot of high ISO photos end up as black and white images, since much of the digital noise manifests itself in color artifacts). Digital "graininess" is referred to as noise.

Set ISO First

When working in Manual Mode, it is a good idea to set the ISO of your camera before the other settings. You can look at the general light of your location to determine this. You should follow this by setting shutter speed and finally work with aperture.

SHUTTER SPEED

Shutter speed is the amount of time light is allowed to come into the camera to create your picture. Measured is a fraction of a second shutter speed has a profound effect on how motion is appears in your photos..

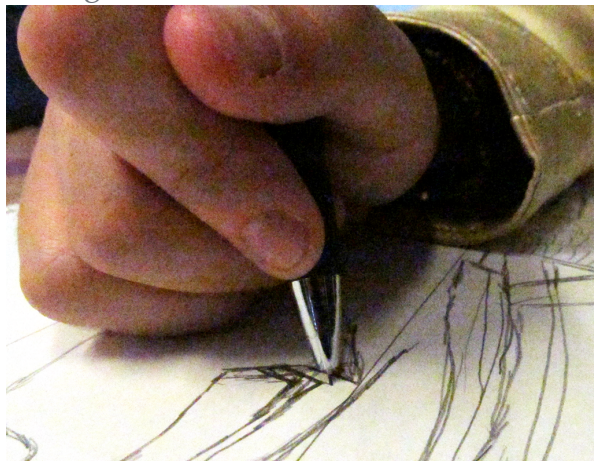
- **1/200 is a relatively fast shutter speed.**
In the first image below, the hand and pen appear sharp, frozen in time, although they were moving during the exposure, the image sensor was ex-

¹ Adapted from Digital Photography Presentation by Camilo Ramirez

posed to the world for only 1/200 of a second.

- 1/10 is a relatively slow shutter speed, the camera is exposing the image sensor to the world for 1/10 of a second. The hand and pen appear blurred because movement occurred during the exposure. Blur is sometimes considered a “problem,” however, other times, it’s a creative choice.

Motion blur varies depending on whether than subject is moving, as well as if the camera itself is moving. In the exercise at the end of this section you will get a chance to experiment with these setting.



APERTURE

Aperture is the size of the opening through which light can enter the camera and is measured in f-stops. The depth of field (DOF) is controlled by aperture. DOF is the the area in front of the lens that will appear in focus.



f/#	2.8	4	5.6	8	11	16	22	32
	●	●	●	●	●	●	●	●
	SMALL #			LARGE #				
	LARGE opening			SMALL opening				
	NARROW DOF			WIDE DOF				

With an aperture of f/2.8 using a large sensor D-SLR or 35mm film camera, you could produce an image like this:



To accomplish the same with the small digital cameras available from the SF cage you would also have to back up and shoot it with the zoom lens set to long (telephoto) mode (for the reason why see the section at the end on Sensor Size).

With an aperture of $f/16$ or higher everything (or more) would be in focus and those blurry locks would come into better focus. Selective focus is often used to focus attention within the composition or to isolate the subject.

Focus can be adjusted manually with the Canon PowerShot cameras available from the SF cage when used in Manual mode.

WHITE BALANCE
 White light is never really pure white, since it is actually a mix of multiple colors. Cameras have a **WHITE BALANCE** setting that allows you to use a white reference to set the camera's white balance, it's reference point for what mix of colors constitutes white.

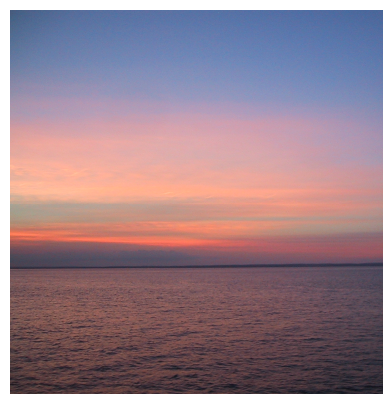
DESCRIBING THE COLOR OF WHITE LIGHT SOURCES

Sunlight is rich in blues, while indoor light is often rich in reds, these two "flavors" of white light comprise the continuum ranging from blue daylight "cool" colors to orange tungsten "warm" colors. The word tungsten comes from the mate-

°Kelvin	Natural Light Sources	Artificial Light Sources
10,000°	Summer Skylight 9,500° to 30,000°	
9,000°	Hazy sunlight 9,000°	
8,000°	Partly Cloudy Sky 8,000° to 10,000°	
	Average summer shade 8,000°	
7,000°	Light summer shade 7,100°	
	Average Summer Sky w/ blue skylight 6,500°	
6,000°	Overcast sky 6,000°	
	Direct Mid-summer Sunlight 5,800°	HMI Lamp 5,600°
5,000°	Summer sunlight at noon 5,400°	Daylight Balanced Fluorescent (Chroma 50) 5,500°
	Early morning & late afternoon sunlight 4,300°	Daylight Blue Photoflood Lamp 4,280°
4,000°		
	One hour after sunrise 3,500°	Photoflood Lamp 3,400°
3,000°		Tungsten Halogen bulb 3,200°
		Tungsten Balanced Fluorescent (Ultra 32) 3,200°
		Domestic electric light bulb 2,900°
2,000°	Sunrise or Sunset 2,000°	
		Candle Flame 1,850°
1,000°		Match Flame 1,700°

rial commonly used to make the filaments of incandescent light bulbs. Fluorescent lights are available in a range of color temperature, some mimic warm "tungsten" light while others mimic cool "daylight" light. The term "color temperature" is used to describe the continuum from warm orange (low color temperature) light sources to cool blue (high color temperature) light sources.

Examine the three images at the top of the next page and consider the following questions: Image 1: Why is the plaza area blue compared to the sun falling on the buildings to the left? Image 2: Why is the interior so orange compared to the light



entering the skylight above the museum floor? Image 3: Why does the light become so orange during a sunset? Our eyes correct for these color differences in a manner that a camera can't, so we have to think about white balance when shooting if we want natural images. In addition, the right white balance is important because it helps prevent one of the color channels being over exposed, which you can't correct in Photoshop.

LEARNING TO USE SF DIGITAL CAMERAS

You can check out **Canon PowerShot SX150 IS** digital cameras from the SF Cage. Basic camera operation is covered in the "Canon PowerShot SX150 IS Getting Started" booklet which includes illustrated step-by-step instructions of basic camera operation. Advanced menu settings, camera modes, and manual operation are covered in the more extensive "Canon PowerShot SX150 IS User Guide" document. PDFs of these two documents along with this and other sections of the *Visual Language Digital Media Cookbook* can be download from the Studio Foundation web site at sf.massart.edu (choose "Resources" from the site menu

and then choose "Visual Language" for the Visual Language Resources and Handout page, from there you will find links to all of the handouts related to the Visual Language course.

BEFORE YOU SHOOT CHECKLIST

We recommend you follow these steps every time you check out a camera from the SF cage before you start shooting. Eventually these will all become second-nature as you prepare for a shoot.

1. Power on the camera

Press the ON/OFF switch on the top of the camera. If the camera does not turn on, try holding down the switch again for a full second. To turn off the camera, push this same button.

2. Set the date

The date on the camera might have already been set, but in any case, if you want accurate time and date stamps stored in your image files, set the date and time zone as described on pages 18 and 19 of the "Canon PowerShot SX150 IS Users Guide."

If this is your first time using the camera, this will provide you with the opportunity to become familiar with the operation of the FUNC. SET button, the Control Wheel, and the MENU button on the back of the camera. You'll be using these for all sorts of things when shooting with this camera. Pressing the top, button, left, or right of the wheel is used for navigating menus. Turning the Control Wheel is often used to select from a variety of choices. Pressing the FUNC. SET and MENU buttons are used to initiate and terminate setting functions.

3. Check the Battery level

When you check out a camera from the cage, turn it on and take a look at the display. If the battery has sufficient charge, no battery-status indication will appear. If the battery is nearly depleted, a battery icon will appear on the display. You can continue shooting in this mode for a while, but once the battery level gets to low, the camera will stop working. In the event of a depleted battery, the message "Change the batteries" will appear on the LCD display. In this event, return the camera to the SF Cage and the batteries will be exchanged with a fresh set.

4. Format the memory card

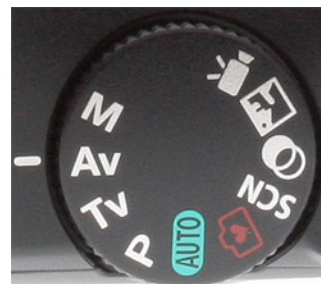
You probably want to start with a clean slate and not have to deal with the previous camera user's images. To format the card, follow the steps outlined on pages 21-22 of the "Canon PowerShot SX150 IS Users Guide." Briefly, go into the Menu, then choose the Tools tab, and then scroll down to the Format Card menu option.

5. Return camera to default camera settings

You probably want to start with all of the camera settings in their default settings and then change what you specifically want to change. To reset the camera to factory defaults, follow the steps outlined on page 47 of the "Canon PowerShot SX150 IS Users Guide." Briefly, go into the Menu, then choose the Tools tab, and then scroll down to the Reset Settings menu option.

6. Set the camera to the desired shooting mode

The camera is capable of operating in a variety of shooting modes (which you select using the mode selection dial on the top):




AUTO: If this is your first time shooting digital stills, you will want to keep things as simple as possible and choose the AUTO mode. In this mode the camera takes care of everything, simply frame up your shot, adjust the zoom setting, and then press the shutter button half-way to let the camera know it should adjust exposure and focus the shot, and if your happy with what's in the frame, press the shutter button all the way to take your picture.

📷 (Discreet): This mode is similar to AUTO mode except the camera sound is muted and the flash is disabled. This is ideal for shooting in locations that pro-

hibit the use of flash and the camera beeping will cause a distraction. This mode is described on page 58 in the “Canon PowerShot SX150 IS Users Guide.”

SCN (Special Scene): In this mode the camera will automatically adjust settings for the specific shooting conditions determined by the specific shooting mode selected. Press the FUNC. SET button to enter the Shooting mode menu and select from one of the following modes: Portrait, Landscape, Kids & Pets, Beach, Foliage, Snow, Fireworks. These are described on pages 58-60 in the “Canon PowerShot SX150 IS Users Guide.” In addition, the camera has a funky Smart Shutter mode that detects faces and a Wink Self-Timer mode that triggers the self timer when you wink. These are described on pages 68-72 in the “Canon PowerShot SX150 IS Users Guide.”

 **(Creative Filters):** This is a fun mode that provides various effects including Super Vivid, Posterized, Fish-Eye, Miniature Model, Toy Camera, Monochrome, Color Accent, Color Swap. These are described on pages 61-68 in the “Canon PowerShot SX150 IS Users Guide.”

P (Programmed AE): This mode is the one you will probably use most often as you become a more advanced photographer. P stands for “Programmed Auto Exposure” and lets you select a range of settings to suite particular shooting conditions. Once you are in this mode you have left point and shoot photography behind, and have entered a world of crea-

tive possibilities. The P mode is described in section 5 starting on page 73 of the “Canon PowerShot SX150 IS Users Guide.” The camera can automatically focus from 2 inches to infinity in the widest angle lens setting and approximately 3.3 feet to infinity at maximum telephoto setting. If the shutter speed selected by the camera is too low for a hand-held shot, then the shutter speed value will be displayed in orange when you depress the shutter button half way. In these situations you can either turn on the flash or choose a higher ISO speed rating. In this mode you can control: Flash (on or off); ISO Speed (Auto, 80, 100, 200, 400, 800, 1600); White Balance (Auto, Daylight, Cloudy, Tungsten, Warm Fluorescent, Cool Fluorescent, Custom); Drive Mode (Continuous, Continuous Shooting AE, Continuous Shooting LV); Image Tone (Vivid, Neutral, Sepia, B&W, Positive Film, Light Skin Tone, Dark Skin Tone, Vivid Blue, Vivid Green, Vivid Red, Custom Color); Focus (Macro, Distance, Manual); and Metering Method (Evaluative, Center Weighted Average, Spot). Note that there are several settings that are set in the MENU instead of the Function Menu related to this mode including AF Frame Mode, Tracking AF, AF-Point Zoom, and Servo SF which are described in the Users Manual. There are a lot of options and settings available to you in this mode, and the best way to learn how they can be used creatively is to plow through the manual and experiment with them. Learning the many functions of this camera will open up the possibility of more creative control over the image

while you are shooting. It can seem daunting at first, but experiment with open feature or option at a time.

Tv (Time value): This mode lets you choose a specific shutter speed. If the aperture value appears in orange when the shutter button is pressed half-way, the current shutter speed exceeds correct exposure limits. For proper exposure adjust the shutter speed so that the aperture value appears in white. There's a Safety Shift mode that will automatically adjust for correct exposure. The Tv mode is described in detail starting on page 96 of the "Canon PowerShot SX150 IS Users Guide."

Av (Aperture value): This mode lets you choose a specific aperture. If the shutter speed value appears in orange when the shutter button is pressed half-way, the current aperture exceeds correct exposure limits. For proper exposure adjust the aperture so that the shutter speed value appears in white. There's a Safety Shift mode that will automatically adjust for correct exposure. The Av, mode is described in detail starting on page 97 of the "Canon PowerShot SX150 IS Users Guide."

M (Manual): This mode lets you adjust both the shutter speed and aperture manually. In manual mode you can adjust the flash output to one of three levels. The M mode is described in detail starting on page 98 of the "Canon PowerShot SX150 IS Users Guide."

Movie: This mode lets you shoot video at 30 frames per second. This mode

is described starting on page 101 of the "Canon PowerShot SX150 IS Users Guide." While the video is not as good as what you can get using the Canon VIXIA camcorders from the SF Cage, it does a reasonable job for what is primarily a still photo camera.

7. Adjust camera settings and functions based on your preferences

Based on the specific mode you choose to shoot in, adjust the various camera settings to suite your specific shooting requirements. This may include, for example, custom white balance for shooting in a mixed-light source environment. It is strongly recommended that you shoot the highest quality images in terms of resolution and compression quality settings. More details on this are available in the next section.

8. You are now ready to shoot!

While you could have saved a lot of set-up time by simply placing the camera in AUTO mode, shooting in one of the other modes and configuring camera functions provides you with more creative control over your images.

9. Viewing your work while shooting

You can view your work while you're out shooting with the camera. Viewing images on the camera is described on page 112 of the "Canon PowerShot SX150 IS Users Guide." Erasing images you don't want to keep is described on pages 123-124. While the camera supports some ed-

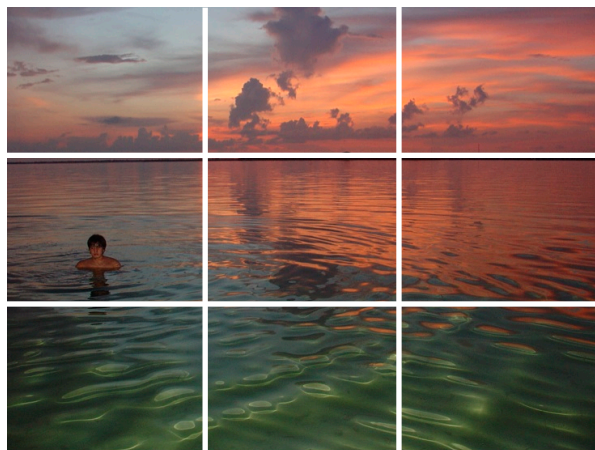
iting functions, these are better done in Photoshop.

COMPOSITION

You can't always control settings, but as long as you can see what you are shooting you can control composition. Composition is how you arrange the objects in the shot by placing your camera. The most common tool to help with this is called the rule of thirds.

RULE OF THIRDS

Most people tend to center the subject of their photos, but you will often get better results by off centering elements into one third of the image's space. If you divide your image into three even columns and three even rows will have a grid to help you with composition. A POINT of INTEREST is formed where ever two lines intersect. Many cameras will allow you to turn on this type of grid.



Look at the image from earlier. Notice how the sky, the red colored water and the green colored water seem to fall into their own row? The person in the water

is not quite on a point of interest but is in the lefthand column. Do you feel the image is balanced?

SHOOTING EXERCISE: FREEZING MOTION

In this exercise you will experiment with the effects shutter speed has on motion by taking a series of pictures.

YOU WILL NEED:

- A camera
- A tripod
- A working faucet.

STEPS:

1. Set your camera on a tripod in front of a faucet. Make sure there is plenty of light and adjust your ISO.
2. Turn your faucet on to the point where water bounces somewhat against the bottom of the sink.
3. Frame your camera on the point where water contacts the sink floor. Be sure not to get the camera wet.
4. Place the camera in SHUTTER PRIORITY mode.
5. Starting with the lowest possible shutter speed take a picture. Then double the shutter speed and taken another. Continue until you reach the fastest shutter speed that still gives an image.
6. Compare your images. What do you notice?

IMPORTING YOUR IMAGES

YOU WILL NEED:

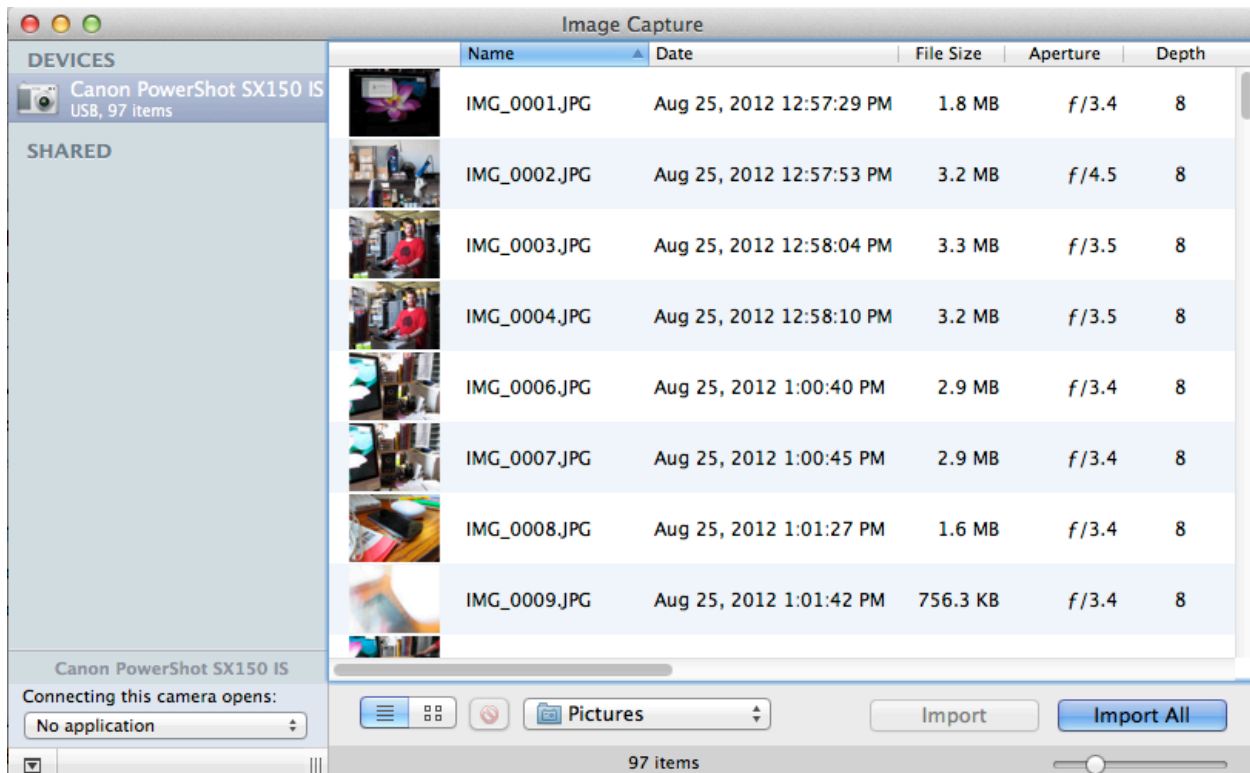
- Canon Powershot camera checked out from the SF Cage
- USB Cable (provided with camera)
- A Mac running Mac OS X 10.7 or later
- Your USB flash drive or external hard drive connected to the Mac

STEPS:

When you are done shooting, you'll want to copy your images from the camera to your own hard drive or USB flash drive. Once you return the camera, it's likely that the next student using the camera will format the SD card before they start shooting and your images will be lost forever! Don't count on media placed on lab computers being available the next day.

To copy images from the camera to the Macintosh, follow these steps:

1. Turn off the camera.
2. Connect the large connector end of the USB cable to the Macintosh;
3. Connect the small connector end of the USB cable to the camera (the USB connector is behind a little door on the side of the camera the wrist strap is connected to);
4. Turn on the camera, the camera will not appear on the desktop as a USB device like some other cameras do;
5. Create a folder on your external hard drive or USB flash drive where you want to store your images
6. Launch the **Image Capture** app, it should display the camera on the

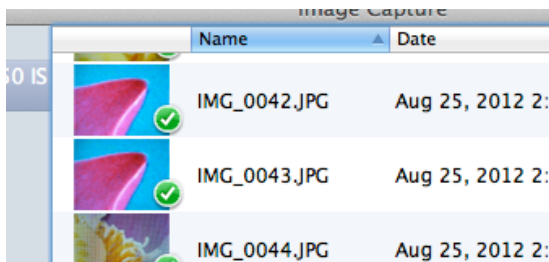


sidebar of its window and a list of images on the camera on the right;

7. Click on the pop-up menu that appears as “Pictures” and navigate to the folder you created in step 4;
8. Select the images you want to transfer and click the “Import” button, alternatively, you can click on “Import All” and all of the images on the camera will be transferred to the folder you designated in step 6; Alternatively, you can simply drag all of the selected images directly to the folder you created in step 5 if you prefer the drag and drop approach;



9. Image Capture will display the progress of the transfer and when it's done, you'll see a green circle with a check mark next to the thumbnails of the images that were successfully transferred;



10. Verify that the images you wanted to transfer from the camera to the folder you specified on your external hard drive or USB flash drive were actually

transferred to the folder you thought they were going to (if you think this is a silly thing to do, go ahead and skip this step at your own peril).

11. Quit out of Image Capture and disconnect the USB cable from the Macintosh and the camera. Don't forget to place both the camera and the USB cable back in the camera case. If you were using your own SD memory card for some reason, make sure the original card from Studio Foundation is placed back in the camera. You don't want to get charged for a missing USB cable or SD memory card when you return the camera.

WHAT SETTINGS WERE USED?

One of the great things about digital photographs is that metadata (i.e., data about data) is embedded in each image with information about the camera used, the shutter speed, the aperture, the ISO setting, etc. Knowing this you can do two things.:

1. When you find photos you like you can find out what settings you used to make the image. Flickr is an excellent resource for this allowing you to also search for photos by the camera and lens they were shot on.
2. After you shoot you can examine the settings you used in programs like iPhoto, Aperture and Adobe Lightroom. Look closely when something went wrong with a shot or when something went right. Look

at the conditions in the environment and think about what settings you might use next time.

SENSOR SIZE, FOCAL LENGTH, AND DEPTH OF FIELD

The size of the sensor used inside the camera to capture the image affects the depth-of-field. Smaller format cameras like the Canon PowerShots available from the SF Cage produce images with a lot of depth-of-field. On the other hand, D-SLRs, due to their large sensor size, make it easy to produce images with shallow depth of field.

Typically when people discuss cameras, they will use the traditional 35mm film

camera as a reference point. For example, you'll typically see brochures refer to the focal length range of a camera's zoom lens in terms of "35mm equivalent."

Cameras with small sensors increases depth-of-field compared to D-SLRs. The increased depth-of-field of smaller format cameras is both good and bad, depending on your perspective and what you are trying to achieve with your photographs.

The good: Increased depth-of-field makes it easier to photograph situations in which everything is sharp (in focus). This is especially valuable when doing macro (extreme close up) photography in which depth-of-field is critical because you're so close to the subject.



The bad: The increased depth-of-field of smaller format cameras makes it more difficult to blur backgrounds that are close to the subject, for example, when shooting a portrait or an object for which you want separation from the background elements.

Why does sensor size affect depth-of-field?

When you compare cameras with different size image sensors, the camera with the smaller sensor, the camera with the smaller sensor will require a lens with a smaller focal length (or would need to be placed further away from the subject). This is necessary in order for the two cameras to produce the same photograph, in other words, produce an image with the same field-of-view or magnification. The shorter the focal length, the greater the the depth-of-field.

Thus, when you compare the depth-of-field of a large sensor camera with a small sensor camera, for any given field-of-view (what part of the world appears in the photograph), the camera with the smaller sensor will require a shorter focal length lens (a wider angle lens) and thus the image will have greater depth of field.

GOING FURTHER

The following resources are recommended for further study of digital photography:

- **Photography 101** (lynda.com/tutorial/123498?org=massart.edu) is a *lynda.com* tutorial that provides a visual, self-paced approach to learning about D-
- **Foundations of Photography: Exposure** (lynda.com/tutorial/71923?org=massart.edu) is a *lynda.com* tutorial that provides a visual, self-paced approach to learning about digital camera exposure.
- **Foundations of Photography: Lenses** (lynda.com/tutorial/76336?org=massart.edu) is a *lynda.com* tutorial that provides a visual, self-paced approach to learning about lenses.
- **Digital Photography Fundamentals**, (manuals.info.apple.com/en_US/Aperture_Photography_Fundamentals.pdf) is a comprehensive introduction to digital photography available in PDF format from Apple. It provides good explanations of digital cameras types, image sensors, color, white balance, resolution, file formats, lenses, depth of field, etc.
- **CameraSim** (camerasim.com) is a web site that demystifies D-SLR cameras and provides a camera simulator showing you the effect of different camera settings. You can also download it as an app.
- **Depth of Field and the Small-Sensor Digital Cameras** (photo.net/learn/optics/dofdigital/) is an article by Bob Atkins that explains the topic in detail.